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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/081,426	02/22/2002	Rajendra Solanki	D8848-02	2992
25397	7590	05/18/2004	EXAMINER	
DUANE, MORRIS, LLP			FULLER, ERIC B	
SUITE 3150			ART UNIT	
3200 SOUTHWEST FREEWAY			PAPER NUMBER	
HOUSTON, TX 77046			1762	

DATE MAILED: 05/18/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/081,426

Applicant(s)

SOLANKI ET AL.

Examiner

Eric B Fuller

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
  - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
  - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
  - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 29 April 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-14 and 20-24 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-14 and 20-24 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Election/Restrictions*

Applicant's election without traverse of Group I, claims 1-14 and 20-24, is acknowledged. Applicant has canceled claims 15-19.

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 3-14, 20, 21, 23, and 24 rejected under 35 U.S.C. 103(a) as being unpatentable over Elers et al. (US 6,475,276 B1) in view of Norman et al. (US 5,322,712) and Rangarajan et al. (US 6,444,038 B1).

Elers teaches an ALD method of forming a copper or silver coating on a silicon substrate that has a TiN barrier layer (column 5, lines 1-35). The precursors are the same as the applicant's claims (column 5, lines 55-60). The process steps are taught in column 4, lines 19-28. The thickness is taught in column 3, line 6. The reference is silent to bubbling the carrier gas through water.

However, Norman teaches that water vapor can accelerate deposition of copper from similar precursors (column 5, lines 45-60). Therefore, to include water in the carrier gas would have been obvious at the time the invention was made to a person

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having ordinary skill in the art with the expectation of achieving accelerated deposition. Additionally, Rangarajan teaches a bubbler used for a vapor deposition process that has the advantage of providing a stable supply of feed material (column 1, lines 30-35; column 2, lines 23-45). Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize the bubbler of Rangarajan in the process taught by Elers, in view of Norman, with the expectation of providing a stable supply of water vapor to the reaction chamber.

Elers fails to explicitly teach the feed times for each reactant and purge gas. However, it would have been within the skill of one practicing in the art to determine the feed times required such that a uniform monolayer is formed on the substrate and/or the reaction space is sufficiently purged.

Claims 2 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Elers et al. (US 6,475,276 B1) in view of Norman et al. (US 5,322,712) and Rangarajan et al. (US 6,444,038 B1), as applied to claims 1 and 21 above, and further in view of Cho (US 5,087,485).

Elers, in view of Norman and Rangarajan, teach the limitations above, but fails to explicitly teach using alcohol as the reducing agent. However, Cho teaches using isopropanol for reducing copper precursors in a vapor deposition process. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to utilize isopropanol as a reducing agent in the process taught by Elers. By doing so, one would have a reasonable expectation of success, as Cho teaches the art

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recognized suitability of using isopropanol to reduce copper precursors for a vapor deposition process.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eric B Fuller whose telephone number is (571) 272-1420. The examiner can normally be reached on Mondays through Thursdays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive P Beck, can be reached on (571) 272-1415. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
EBF

  
TIMOTHY MEEKS  
PRIMARY EXAMINER